tion, but with a velocity slightly less than that of the shell, the result being that, with respect to the shell, the nucleus makes one revolution to the west in 952 years. On this revolving nucleus the author assumes there are projecting or "active" spots which in their motion come under weak portions of the crust and cause earthquakes and volcanic disturbances. On this basis he calculates the positions of the active spots on the nucleus which have during the last sixty years produced disturbances notified by ships at sea in the tropical parts of the Atlantic. According to the calculation, these active spots are now nearly all collected under the region between longitude 35° and 41° W., and latitude 1° N. and 1° S., which should therefore be a danger zone. It will be interesting to see if further statistics support this theory.

WE have received from Lu-kia-pang, China—which now serves as the magnetic observatory of the Jesuit fathers of Zi-ka-wei—an interesting copy of the record of the great magnetic storm of September 25, with some notes thereon. The storm in China was of similar duration to that experienced in this country, and presented many similar features, but the oscillations were of a much less striking character. The ranges of the declination and vertical force disturbances—about 50′ and 0·002 C.G.S. respectively—were much less than in Europe. The range in horizontal force, however, exceeded 0·005 C.G.S., and the excess may have been large, as the trace was off the sheet during the greater part of the storm. About three hours before the large disturbance began there was a curious little movement, seen in all the elements, which is described in the "Notes" as a precursor of the storm. We understand that movements corresponding to the supposed precursor are distinctly shown on the Kew curves, so that whether related or not to the great storm they seem to have been, like it, experienced all over the world.

THE dissociation of hydrobromic and hydriodic acids at high temperatures is the subject of a paper by K. V. v. Falckenstein in the current number of the *Zeitschrift für physikalische Chemie*. The method used is the statical one, first employed by Löwenstein, and is based on the fact that at a high temperature platinum permits the passage of hydrogen, but of no other gas. The action of the red-hot metal may be roughly regarded as a filter, the pores of which are so small that only the very small hydrogen molecules can pass through. The gaseous hydrogen compound, contained in a fused quartz tube and heated in an electric resistance furnace, passes over a platinum bulb, the inside of the latter being connected to a manometer. The pressure of the hydrogen inside the bulb is in equilibrium with the hydrogen outside the bulb arising from the dissociation. Data are given for three temperatures, 1024°, 1108°, and 1222°, in the case of hydrobromic acid, and for two, 1022° and 1217°, for hydriodic acid. Bodenstein and Geiger have measured the E.M.F. at 30° of the cell Br_2—HBr—H_2, and Haber has deduced a formula for the relation between the amount of dissociation of the hydrobromic acid and the temperature. It is interesting to note that the dissociation calculated from this formula, in spite of the large temperature difference between 30° and 1200°, is in very fair agreement with the experimental results described in this paper.

THE sixty-sixth annual issue of the Medical Directory, for 1910, published by Messrs. J. and A. Churchill (price 14*s*. net), includes several new features. It appears from the numerical summary that there are 40,558 members of the medical profession, the increase from 1909 to 1910 being 566. The directory includes, for the first time, a section on the principal British spas and climatic health resorts, by Mr. N. H. Forbes. Improvements have also been made in the list of hospitals and other institutions printed at the end of the London section of the directory.

MESSRS. CHARLES GRIFFIN AND CO., LTD., have published a sixth edition of Prof. Grenville A. J. Cole's "Aids in Practical Geology." Alterations have been made in more than a hundred places, and the subject-matter has in this way been brought up to date. While certain modern restrictions in nomenclature have been introduced, the limits of the names of rocks and fossil genera have, as in previous editions, been kept as wide as possible. Prof. Cole's book has been of signal service to very many practical geologists since its first publication in 1890, and in its latest revised form we have no doubt its sphere of usefulness will be extended.

OUR ASTRONOMICAL COLUMN.

HALLEY'S COMET, 1909*c*.—As was briefly stated on p. 239 of our issue of last week, M. Deslandres has added to the large reflector at Meudon a finder, fitted with a moving reticle, which enables the instrument to be used for photographing any faint object moving in relation to the surrounding guiding stars. The aperture of the large reflector is 1 metre, the focal length 3 metres, and an exposure of five minutes, on December 6, 7, and 8, was sufficient to give a sharp image of the comet's central portion. With an hour's exposure the comet was seen, on the negative, as a nebulosity, elongated in the direction opposed to the sun. The finder now in use has an aperture of 15 cm. (6 inches) and a focal length of 2·3 metres, and may be placed on either side of the telescope to suit the convenience of the observer, a suitable counterpoise of the same form being employed on the opposite side.

In conjunction with M. Bernard, M. Deslandres also describes two spectra of the comet secured on December 6 and 8 with exposures of two hours and three hours respectively. That the comet, on December 6, was already emitting its own radiations is shown by the appearance of bright condensations at λ 388 and λ 391·45, as in Morehouse's comet last year. In addition to the nearly circular nucleus, several curved rays, fainter than the nucleus and having the appearance of antennæ, were seen; from their direction it is difficult to account for these rays solely on the assumption that they are produced by solar repulsion. A spectrum taken on December 13 shows the continuous spectrum of the nucleus stronger and the condensations in the ultra-violet larger, the latter radiations evidently emanating from the nebulosity surrounding the nucleus. There is also some evidence for the oscillations of brightness observed at Greenwich (*Comptes rendus*, No. 24, December 13).

Other visual observations of the comet are recorded in No. 4377 of the *Astronomische Nachrichten*, where Prof. A. A. Iwanow also has a paper describing his calculations of the perturbations of the comet's path between 1835 and 1910. His final elements give April 23, 1910, as the probable date of perihelion passage.

AN INTERESTING SUN-SPOT.—In No. 4377 of the *Astronomische Nachrichten* M. Amaftounsky describes the changes in detail which took place in a sun-spot first seen on the sun's eastern limb on September 27 (September 15 O.S.). Six drawings which accompany the paper show how enormous were the changes, and M. Amaftounsky directs special attention to a marked yellowish-green tint which pervaded the bright tongues, or bridges, over the nucleus and the bright edges of the penumbra. This was not an optical coloration, and, according to the observer, is a very rare phenomenon.

PERIODS IN THE VARIATION OF LATITUDE.—No. 8 of the *Bulletin International de l'Académie des Sciences de Cracovie* (October, p. 543) contains a *résumé*, in French, of a memoir by M. Jan Krassowski, in which the author briefly discusses the results obtained by him in an analysis, by Schuster's "periodogram" method, of the motion of the pole. The data employed consisted of all the results

published by the International Latitude Service since 1908. Periods of one-fortieth of a year (9·125 days) were taken, and the values for x and y analysed independently, special attention being paid to the possible demonstration of a yearly period.

The resulting maxima show no trace of an annual period, but there is a weak maximum at thirteen months. A very strongly marked period, of 419·750 days for the x, and 410·625 days for the y, coordinate, was found, and agrees fairly well with the period (428 days) found by Chandler. Another less marked period of 438·0 days also results from M. Krassowski's investigation, and agrees with that found by Mr. Kimura.

THE PLANET VENUS.—In a very interesting lecture, now published in the December number of the *Popular Science Monthly* (vol. lxxv., No. 6, p. 521), Prof. Lowell describes the observations which have been made of the planet Venus, at present so prominent an object in our evening skies. Not only are the observations described, but the results accruing from them are discussed in popular language. Thus the spectroscopic and visual observations are held to have proved that the rotation and revolution of Venus are synchronous, the period being 225 days. A number of drawings accompanying the paper show the permanent markings recorded, and illustrate the unanimity of the observers working under good conditions. The main feature is a number of dark markings which, leaving the limb at different points, converge to the centre, thus giving the planet's disc a cart-wheel appearance.

SUGGESTED OBSERVATIONS OF HALLEY'S COMET.

THE Astronomical and Astrophysical Society of America, through its comet committee, is soliciting cooperation in the observation of Halley's comet at the present return, and has prepared a circular letter of advice that has been widely distributed among observatories with regard to such observations. A copy of this circular will be sent to any astronomer who may desire to use it upon request being made to the chairman of the committee, Prof. G. C. Comstock, Washburn Observatory, Madison, Wisconsin. As many astronomers and other observers of Halley's comet will be interested in the suggestion made by the committee, the circular is here reprinted in a slightly abridged form.

It is desirable that the position of the comet be well observed during the entire period of its visibility, and it seems probable that extra-meridian observations will be secured in sufficient number without especial solicitation. In view, however, of possible large perturbations arising from the close approach of the comet to Venus on May 1, and to the earth on May 18, meridian observations are especially desired during the period in which the comet is sufficiently bright for that purpose. An examination of the amount and character of these comet perturbations and their adaptability to a determination of the mass of the planets producing them has been undertaken by Profs. Leuschner and Crawford, and in case the conditions prove favourable, the meridian determinations may well be supplemented by heliometer observations of the positions of the inner planets with the view of a possible determination of the mass of the comet itself.

The close approach of the comet to the earth promises unusual opportunity for a study of the physical conditions that obtain in such a body, and, as an indispensable basis for such study, the committee recommends a photographic campaign as long and as nearly continuous as possible. The comet's close proximity to the sun's direction at the time of maximum brilliance imposes serious limitations upon this programme, and widely extended cooperation will be required throughout the whole circuit of the earth if this ideal of a continuous photographic record is to be even remotely realised.

About one-third of the earth's circumference in longitude is covered by the Pacific Ocean, within which there is known to exist no observatory with proper facilities for celestial photography. To fill this gap, at least partially, the committee, aided by a grant from the National Academy of Sciences, proposes to send to the Hawaiian Islands an expedition to photograph the comet during the period of its greatest brilliance.

The ends to be served by these photographs, and others obtained elsewhere, are as follows:—

To give a permanent record, as continuous as possible, of the phenomena and changes (1) in the tail of the comet, with special reference to outgoing masses; (2) in the head and nucleus of the comet, particularly as to the formation of envelopes and jets.

The following suggestions as to procedure and precaution in making the photographs have been formulated by Prof. Barnard.

Photography of Comets.

One of the greatest difficulties in photographing the average bright comet is its proximity to the horizon, and consequent projection on a more or less dawn or twilight sky. The effect of this illuminated background with any considerable exposure is to fog the plate to such an extent as either to ruin it or to prevent a proper development of the image of the comet. A difference of three or four minutes in the duration of exposure when the sky is brightest may make a success or a failure of the picture. It is impossible to establish fixed rules as to when the exposure should stop or begin; so much will depend upon the condition of the sky, the position of the comet, the kind of lens, the rapidity of the plates, &c. The best rule is that of the judgment of the observer at the time, and this can only be derived from actual experience in the work.

The plates should be backed with the following to prevent halation. Cook two pounds of white sugar in a saucepan without water until nearly in the caramel stage, then add one pound of burnt sienna. Cook a little more (but not to the candy stage), stirring well. Finally, add about one-half an ounce of alcohol to each pint of backing as a dryer. This backing will keep indefinitely. When it is too hard, moisten it with a little water. This is to be applied to the back of the plate as a stiff paste with a broad camel's-hair brush, and should be applied just before using. A piece of old newspaper pressed upon this will prevent its being rubbed. The face of the plate should be very carefully dusted with a broad camel's-hair brush after it has been placed in the plate-holder. The camera tube should also be frequently wiped out with a damp cloth to avoid dust. Before developing, remove the backing with moist absorbent cotton. If a little remains on the plate it will not injure the developer. In removing the backing be careful to shield the plate from the dark-room light. Do not wet the surface of the plate before pouring on the developer, as it may cause air bubbles on the film; swab it carefully with absorbent cotton at the beginning of development. Develop until the plate is almost opaque to the ordinary developing light. Fix for twenty minutes or more in the ordinary fixing bath (frequently made new), to which has been added a teaspoonful of sodium bisulphite to prevent discoloration.

Lumière Sigma dry plates are recommended, because of their rapidity. Seed 27 Gilt Edge and Cramer Crown are both beautiful plates, but are not now so rapid as the Sigma.

Hydrochinon developer gives a good strong negative, and for astronomical work is excellent. Rodinal in a weakened form, say 1/60 or 1/70 of water, with a longer development, will give a soft and more transparent negative, especially suited for showing the details of the head of the comet on large-scale photographs.

The doublet, or portrait lens, such as is made in America by the Brashear Optical Company and the Alvan Clark Corporation, on account of its wide field, is the best form of instrument for showing the general features of the comet and its tail, and especially for following any outgoing masses that may appear in the tail. One of about 6 inches (15 cm.) aperture will be the most generally used, because of the expense of such instruments. It should be supplemented by several smaller lenses. A "lantern" lens of 1½ inches (4 cm.) aperture and about 6 inches (15 cm.) focus, made by McAllister, of New York, is recommended for showing the extent of the tail. The cost of one of these lantern lenses is seven dollars. It gives a good field of twenty to thirty degrees, especially when diaphragmed